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## PATENT SPECIFICATION



Convention Date (France): Sept. 13, 1926.

277,370

Application Date (in United Kingdom): Sept. 12, 1927. No. 23,935/27.

Complete not Accepted.

### COMPLETE SPECIFICATION.

#### Improvements in or relating to the Transportation of Fragile Vessels.

We, THE GENERAL ELECTRIC COMPANY LIMITED, of Magnet House, Kingsway, London, W.C. 2, a British company, and EZECHIEL WEINTRAUB, of 14 Rue des Marronniers, Paris, France, a citizen of the United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The transportation of fragile or brittle vessels containing free solid or liquid bodies, particularly, for example, the glass envelopes of mercury vapour rectifiers and lamps, and also their permanent installation on a vehicle subject to tremors and shocks (for example an electric locomotive) necessitates taking special precautions to guard against the destructive action which violent displacements of these free liquid or solid bodies due to shocks or tremors, may have on the walls of the vessel.

Various proposals have already been made to reduce or suppress these actions, but in general they are only provided at the expense of great constructional complications, and their efficacy may even become illusory, if, in particular, the crate enclosing the vessel be turned upsidown during transportation either as the result of a very violent shock, or because the staff responsible for handling the crate fails to note the markings it carries.

The object of the present invention is to provide a method of suspending the vessel in its crate or on the frame of the vehicle which is intended to receive it, which lends itself to simple and very efficacious constructional arrangements.

According to the present invention in a method of transporting vessels having envelopes composed of a fragile or brittle substance, for example glass, and containing free solid or liquid bodies, the vessel is so mounted in suspension means

as to be capable of simultaneous rotation about two non-coincident axes.

In carrying out the method in accordance with the invention, the vessel to be transported, which may be a mercury vapour rectifier or the like, may be mounted in a support comprising means adapted to receive the rectifier or the like, which means are mounted in gimbals.

The invention will now be described by way of example with reference to the accompanying drawings which show an arrangement for supporting a mercury vapour rectifier with a glass envelope within a crate during transportation. The rectifier is shown in the normal position for transportation, that is to say with the condensation chamber turned to the bottom so that the mercury collects in the bottom of it.

Figure 1 shows a vertical section through the rectifier and its crate on a plane passing through the axis of suspension, and Figure 2 shows a section on a horizontal plane passing through the centre of suspension of the rectifier.

The condensation chamber 1 of the rectifier is supported in a shock-absorbing casing of circular external shape in the plane of the point of suspension; this shock-absorbing casing 2 is fixed at two diametrically opposite points to radial arms 3, 4, forming radii of a circular ring 5 swinging about two fixed axes 6, 7 on the same diameter and so disposed that the vertical plane through them makes an angle of 90° with the vertical plane containing the radii 3, 4. These fixed axes 6, 7 are themselves rigidly supported in a second ring 8, which can oscillate about two diametrically opposed axes 9, 10. These axes of oscillation are fixed in the vertical walls 11 and 12 of the crate, and are placed in a vertical plane passing through the centre of suspension 13 and perpendicular to the plane containing the axes of oscillation 6, 7 of the ring 5.

Casing 2 surrounding the condensation

[Price 1/-]

chamber 1 is ballasted so as to keep the centre of gravity distinctly below the point of suspension, so that the couple due to the weight of the mercury and the ballasted casing, is sufficient to overcome the friction of the various pivots and to bring the centre of gravity of the vessel back into the vertical through the point of suspension.

Suppose there be a horizontal shock, for example in the direction of arrow 14 (Figure 2) in the direction of radii 3, 4, there will be a tendency for the vessel to be displaced in the vertical plane containing these radii, in the direction of arrow 15 (Figure 1) owing to the swing suspension of the ring 5 about the axes 6, 7; but as soon as the tube has been displaced from its equilibrium position, the couple due to the weight of the vessel and casing will tend to restore it to its equilibrium position, and will therefore oppose the action of the shock received in the direction of arrow 14, and will in consequence check the movement of the vessel; this action of the couple grows proportionally as the vessel moves further from the equilibrium position till it neutralises the action of the shock and then restores the vessel to the equilibrium position. It is the same if the shock acts in the direction of arrow 16, but this time it is due to the ring 8 that the oscillation can take place, in the vertical plane containing the axes 6, 7, around the axes 9, 10. If the shock act in any direction, such as that of arrow 17, the oscillatory movements in the two vertical planes are performed simultaneously so as always to restore the vessel to the vertical equilibrium position. If the crate be turned over top for bottom, it is easily seen that the vessel will perform a movement of relative rotation, with respect to the crate, in the interior of the sphere generated by the two circular rings, and will always be found in the position shown in the drawings.

The suspension described above not only offers the advantage of always keeping the vessel substantially in the vertical equilibrium position or in any case of restoring it to it after it has deviated therefrom, but in addition that of increasing the duration of the vessel's oscillations.

The arms 3, 4, connecting the casing 2 for the vessel to the ring 5 have been shown in a plane perpendicular to the

axes of oscillation 6, 7 of this ring to simplify the comprehension of the working of this mode of suspension, but it is preferable to arrange these arms in the vertical plane bisecting the angle formed between the two vertical planes of suspension of the rings, for example, in the vertical plane whose trace is represented by the diagonal AB of the crate, in the plane of Figure 2, in order to avoid any dead point in the complete arrangement.

The constructional arrangements given above have only been given by way of example, and they can be modified without going outside the scope of the invention.

The mode of suspension which is the subject of this invention may, particularly for transportation, advantageously be combined with the arrangements forming the subject of our co-pending patent application No. 12170 of 1927, (278615), entitled "Improvements in Mercury Vapour Rectifiers and like Apparatus", and which consist in collecting the mercury into the least fragile part of the envelope and restraining it by means of grids, baffles or the like so placed between this part and the rest of the envelope as only to allow the mercury to flow slowly when shocks or vibrations tend to make it leave the space in which it is collected.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. The method of transporting vessels having envelopes composed of a fragile or brittle substance, for example glass and containing free solid or liquid bodies, according to which the vessel is so mounted in suspension means as to be capable of simultaneous rotation about two non-coincident axes.

2. A support for a mercury vapour rectifier or the like comprising means adapted to receive the rectifier or the like, these means being mounted in gimbals.

3. A support for a mercury vapour rectifier or the like substantially as described with reference to the accompanying drawings.

Dated the 12th day of September 1927.

For the Applicants,  
W. G. LLEWELLYN,  
Chartered Patent Agent.

